

Appendix A

Request for Analysis



Department of Energy

Washington, DC 20585

March 3, 2000

The Honorable Jay E. Hakes
Administrator
Energy Information Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Dr. Hakes:

On December 3, 1999, the Department sponsored a meeting that included representation from six oil and gas trade associations: the American Petroleum Institute, Domestic Petroleum Council, Independent Petroleum Association of America, U.S. Oil and Gas Association, National Ocean Industries Association, and Natural Gas Supply Association. The purpose of the meeting was to address concerns raised about depletion and related issues, and their potential affect on the Nation's future supplies and prices of oil and natural gas.

Depletion of oil and gas is a fundamental issue that can be associated with a number of ancillary issues such as capital availability, price volatility, deliverability, and the need for advances in technology. Some of these issues are addressed in recent work such as that of the National Petroleum Council's report "Meeting the Challenge of the Nation's Growing Natural Gas Demand." However, based on dialogue with the trade associations, we feel it would be valuable for the Nation to have the Energy Information Administration (EIA) perform a study on the specific issues of depletion effects, oil price sensitivity, technology impacts, and land access. This letter provides guidance for a Service Report that we would like you to generate to address these topics.

Depletion Effects. Depletion analysis in the Service Report should be conducted from both historical and outlook perspectives through the year 2020. The analysis should use EIA reserve and production data and analyze outlook scenarios based on the EIA *Annual Energy Outlook 2000 (AEO2000)*.

Examination of historical trends should document the rates of change in initial production and subsequent depletion by region, over the past twenty years or more, especially in maturing provinces such as the shallow Gulf of Mexico and Texas. The historical analysis provides an opportunity to increase the transparency of EIA's databases for industry concerning the issue of depletion.

To assess the effects of depletion on oil and gas supply, two cases should be examined. The first will be EIA's existing Reference Case (Table A15 in *AEO2000*) showing supply source detail. Although we believe that the Reference Case is properly capturing depletion, there is a perception that the fundamental nature of depletion may be undergoing change that may not be reflected in historical data. Specifically, the perception is that the remaining oil and gas fields in the United States are becoming smaller and more costly to find, while being produced at faster rates than in the past. To address this concern, we advise that an "Accelerated Depletion" Case

be developed by adjusting key variables such as finding rates, production-to-reserves ratios, inferred reserves and production profiles as appropriate. The outputs of the analysis should consider the effects on prices and production as they relate to the combination of these key variables.

Oil Price Sensitivity. In view of the swings in oil prices of the recent past, we recommend that two sensitivity cases be developed using high and low world oil prices defined in *AEO2000* (Table C12), based on the Accelerated Depletion Case described above. The analysis should consider the effects on natural gas prices and oil and gas production.

Technology Impacts. Technology is closely connected with depletion. We thus seek to understand how changes in the trends of technology progress might affect the future, given that accelerated depletion may be occurring. This issue can be addressed by developing "Accelerated Depletion with Technology" Cases that address the impacts of slow and rapid technology progress (Table F13 in *AEO2000*) on the Accelerated Depletion Case described above. These cases should seek to examine the ability or inability of technology progress to arrest accelerated depletion effects and should consider key input variables such as drilling, operating and lease costs and success rates.

Land Access. Finally, a case should be developed that addresses a scenario of increased access to Federal lands, focusing on the Rocky Mountain region. The "Access" Case should use key input variables as defined in the Accelerated Depletion Case, while improving access to conventional and unconventional resources underlying Federal lands.

We would like the study to be concluded by July 2000. EIA's assessment of these important issues would enable policymakers and the public to better understand the supply and demand concerns related to the Nation's oil and gas industry. If you have any questions concerning these requirements, please contact Nancy Johnson or John Pyrdol in the Office of Natural Gas and Petroleum Technology.

Sincerely,



Robert S. Kripowicz
Principal Deputy Assistant Secretary
for Fossil Energy



Department of Energy
Washington, DC 20585

May 19, 2000

Ms. Mary Hutzler
Director, Integrated Analysis and Forecasting
Energy Information Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Ms. Hutzler:

On March 3, 2000, we formally requested that the Energy Information Administration (EIA) undertake an analysis of depletion and related issues and their potential affect on the Nation's future supplies and prices of oil and natural gas. The purposes of this letter are to recommend the specific cases we would like you to consider and to fully define the assumptions to be used.

To capture the spectrum of depletion effects and the influence of price, technology (or lack thereof) and land access to countermand these effects, we have resolved the study into the following specific cases:

- Reference,
- Accelerated Depletion,
- Accelerated Depletion with High World Oil Price,
- Accelerated Depletion with Low World Oil Price,
- Accelerated Depletion with Slow Technology,
- Accelerated Depletion with Improved Productivity Technology,
- Accelerated Depletion with Rapid Technology,
- Accelerated Depletion with High Land Access,
- Accelerated Depletion with High Land Access and Improved Productivity Technology, and
- Accelerated Depletion with High Land Access and Rapid Technology.

The specific settings and assumptions for the National Energy Modeling System are provided in Exhibits 1 through 3, attached. The outlooks for these cases should be examined through the year 2020.

These cases will provide a foundation on which to thoroughly examine depletion issues, addressing public concerns and providing policy guidance. If you have questions concerning these cases and assumptions, please contact John Pyrdol or Nancy Johnson in the Office of Natural Gas and Petroleum Technology.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert Kripowicz", is written over the typed name.

Robert Kripowicz
Principal Deputy Assistant Secretary
for Fossil Energy

Enclosure

Exhibit 1. Reference, Accelerated Depletion, and Accelerated Depletion/World Oil Price Cases

Cases	Conventional Resources		Unconventional Resources		Use settings from:		
	Levers	Settings	Levers		Slow Tech Case	Reference Case	Rapid Tech Case
Reference	P/R ratio (new stock)	AEO Reference case	N/a				
	Production Profile	AEO Reference case	N/a				
	Success Rates	AEO Reference case	N/a				
	Costs	AEO Reference case		Optimization and Cost Reduction Tech.		3.7.8	
	Finding Rates	AEO Reference case		Reservoir Characterization and Well Performance Tech.		1,2,5,6	
	Rocky Mtn. Resources	Decrease by 8% from AEO Reference case		Access to Resources		11	
Accelerated Depletion (AD)	N/a			Exploration/ Breakthrough Tech.		4.9,10	
	P/R ratio (new stock)	Increase by 33%	N/a				
	Production Profile	Faster decline by 33%	N/a				
	Success Rates	Reference case	N/a				
	Costs	Reference case		Optimization and Cost Reduction Tech.		3.7.8	
	Finding Rates	Decrease by 33%		Reservoir Characterization and Well Performance Tech.	1,2,5,6		
Accelerated Depletion with High World Oil Price	Rocky Mtn. Resources	Reference case		Access to Resources	11		
	N/a			Exploration/ Breakthrough Tech.	4.9,10		
	AD levers	AD settings	AD levers		AD settings		
	Oil prices	High AEO price track	Oil prices		High AEO price track		
	AD levers	AD settings	AD levers		AD settings		
	Oil prices	Low AEO price track	Oil prices		Low AEO price track		

Exhibit 2. Accelerated Depletion with Technology and Access Cases

Cases	Conventional Resources		Unconventional Resources		Use settings from:	
	Levers	Technology or Resource Settings	Levers		Slow Tech Case	Rapid Tech Case
Accelerated Depletion w/ Slow Technology	AD settings with:					
	Success Rates	Decrease by 50%	N/a			
	Costs	Decrease by 50%	Optimization and Cost Reduction Tech.		3,7,8	
	Finding Rates	Decrease by 50%	Reservoir Characterization and Well Performance Tech.		1,2,5,6	
	Rocky Mtn. Resources	Reference case	Access to Resources		11	
Accelerated Depletion w/ Improved Productivity Technology	N/a		Exploration/ Breakthrough Tech.		4,9,10	
	AD settings with:					
	Success Rates	Reference case	N/a			
	Costs	Reference case	Optimization and Cost Reduction Tech.		3,7,8	
	Finding Rates	Increase by 50%	Reservoir Characterization and Well Performance Tech.			1,2,5,6
Accelerated Depletion w/ Rapid Technology	Rocky Mtn. Resources	Reference case	Access to Resources		11	
	N/a		Exploration/ Breakthrough Tech.		4,9,10	
	AD settings with:					
	Success Rates	Increase by 50%	N/a			
	Costs	Increase by 50%	Optimization and Cost Reduction Tech.			3,7,8
Accelerated Depletion w/ High Access	Finding Rates	Increase by 50%	Reservoir Characterization and Well Performance Tech.			1,2,5,6
	Rocky Mtn. Resources	Reference case	Access to Resources		11	
	N/a		Exploration/ Breakthrough Tech.			4,9,10
	AD settings with:					
	Success Rates		Optimization and Cost Reduction Tech.		3,7,8	
Accelerated Depletion w/ High Access and Improved Productivity Technology	Rocky Mtn. Resources	Increase by 8%	Reservoir Characterization and Well Performance Tech.		1,2,5,6	
	N/a		Exploration/ Breakthrough Tech.		4,9,10	
	AD settings with:					
	Success Rates	Reference case	N/a			
	Costs	Reference case	Optimization and Cost Reduction Tech.		3,7,8	
Accelerated Depletion w/ High Access and Rapid Technology	Finding Rates	Increase by 50%	Reservoir Characterization and Well Performance Tech.			1,2,5,6
	Rocky Mtn. Resources	Increase by 8%	Access to Resources			11
	N/a		Exploration/ Breakthrough Tech.		4,9,10	
	AD settings with:					
	Success Rates	Increase by 50%	N/a			
Accelerated Depletion w/ High Access and Rapid Technology	Costs	Increase by 50%	Optimization and Cost Reduction Tech.			3,7,8
	Finding Rates	Increase by 50%	Reservoir Characterization and Well Performance Tech.			1,2,5,6
	Rocky Mtn. Resources	Increase by 8%	Access to Resources			11
	N/a		Exploration/ Breakthrough Tech.			4,9,10
	AD settings with:					

Exhibit 3. Unconventional Resources--Technology and Access Settings

Unconventional Resources		Settings for:			
Levers	Resource Type	Slow Tech Case	Reference Case	Rapid Tech Case	
1 Basin Assessment/hypothetical Plays	All unconventional resource types	No improvement	Yr. 2016	Yr. 2011	
2 Extended resource characterization/ Emerging Basins	Tight gas sands	-0.5%/yr	-1.25%/yr	-2%/yr	
	Coalbed methane	-0.5%/yr	-1.00%/yr	-1.5%/yr	
	Gas shales	-0.5%/yr	-1.00%/yr	-1.5%/yr	
3 Well performance diagnostics and remediation/ Proved reserves	Tight gas sands	1%/yr (decline to 0%)	2%/yr (decline to 0%)	3%/yr (decline to 0%)	
	Coalbed methane	1.5%/yr (decline to 0%)	3.0%/yr (decline to 0%)	4.5%/yr (decline to 0%)	
	Gas shales	1.5%/yr (decline to 0%)	3.0%/yr (decline to 0%)	4.5%/yr (decline to 0%)	
4 Natural fracture detection R&D	All unconventional resource types	No improvement	+ 0.25%/yr from yr 2000	+ 0.50%/yr from yr 2000	
	All unconventional resource types	No improvement	ID "best" 30% by 2017	ID "best" 30% by 2007	
5 Geol./tech. modeling & matching	All unconventional resource types	No improvement	5%	10%	
6 Improved drilling & stimulation	All unconventional resource types	5%	10%	15%	
7 Lower cost drilling & stimulation	All unconventional resource types	-5%	-10%	-15%	
8 Water & gas treating R&D	All unconventional resource types	-10%	-20%	-30%	
9 Horizontal wells	Tight gas sands	No improvement	10% yr 2011	15% yr 2011	
Advanced cavitation	Coalbed methane	No improvement	20% yr 2011	30% yr 2006	
Multilateral completions	Gas shales	No improvement	No improvement	15% yr 2011	
10 Other tight gas technology	Tight gas sands	No improvement	+10% yr 2021	+10% yr 2016	
a. Enhanced CBM recovery efficiency	Coalbed methane	No improvement	+30% yr 2015	+45% yr 2010	
b. Enhanced CBM O&M	Coalbed methane	N/A	\$1.00/Mcf, incremental	\$0.75/Mcf, incremental	
Other technology	Gas shales	N/A	N/A	N/A	
11 Access restrictions	All unconventional resource types	No improvement	Removed in 50 yrs (1%/yr)	Removed in 25 yrs (2%/yr)	